REMARKS

Before discussing the specific rejections of the Office Action, significant differences between Applicant's invention and the main prior art references of Roth '117 and Cheng '777 are discussed. With regard to Applicant's invention, as depicted in Figs. 5, 6, 12 and 13, it is a goal of Applicant's invention is to control the height of components 20 or 60, 68, that are fabricated on a substrate surface. Neither Roth '117 or Cheng '777 are directed towards this goal. Specifically, the height of the components 14 of Roth are not affected by Roth's CMP step as depicted in Fig. 5. Likewise, the height of the components 14 of Cheng '777 are not affected by the CMP polishing step therein as depicted in Figs. 4 and 5. Cheng is basically directed towards the fabrication of an electrical interconnect 20 between the components 14. As a result, and as is explained in greater detail herebelow, there are significant differences between the claims (as amended herein) and the teachings of Roth and Cheng.

In paragraphs 1 and 2 of the Office Action claims 1-4,15 and 27 rejected under 35 U.S.C. 102(b) as being anticipated by Roth et al (5,272,117), stating:

> "As to claims 1,3 and 15, Roth et al teach that a plurality of upwardly projecting components(14) are formed on a substrate (12) and a polish-stop layer (18) is formed over the components (col. 3, lines 5-18 and lines 51-52 and figure 2).
>
> Roth et al also teach that a polishable layer (20) is deposited above the etch-stop layer (col. 4, lines 5-8).
>
> Roth et al, teach that a polishing step is performed for planarizing the polishable layer at a point in time wherein the polish-stop layer is exposed using a polishing slurry in a chemical mechanical polishing (CMP) process (col. 4, lines 14-18, lines 38-41).
>
> Roth et al, further teach that a portion of the stop layer is removed subsequent to the polishing step (col. 5, lines 10-11).
>
> As to claim 2, Roth et al teach that the polish-stop layer polishes at a slower rate than the material to be polished (col. 3, lines 51-55). So, the polish-stop layer is more resistant to the polishing slurry compare to the polishable layer.
>
> As to claims 4 and 27, Roth et al teach that a first layer (16) with a projecting portion is deposited upon the substrate's components (col. 3, lines 39-40 and figure 1)."

Responsive thereto, Applicant has amended independent claims 1, 15 and 27, and Applicant asserts that the claims, as amended, are not anticipated by Roth '117, as is next discussed.

With regard to amended independent claim 1, it basically describes Applicant's process that is depicted in Figs. 7-13. The last limitation in claim 1, which states: "removing portions of said stop layer subsequent to said polishing step." is depicted in Figs. 12 and 13 and is not taught by Roth. Specifically, with regard to the teachings of Roth, it is seen in Fig. 4 of Roth that the stop layer remnants 18 are covered by a polishable layer 20. In Fig. 5 it is seen that a CMP step is undertaken to remove the portions of the layer 20 above the stop layer 18. Significantly, it is then seen in Fig. 6 that further components 22 are fabricated on top of the polished surface of Fig. 5. Thus, as is seen in Fig. 6, the stop layer segments 18 are not removed subsequent to the polishing step depicted in Fig. 5. Therefore, Roth does not anticipate the last of the limitations of amended independent claim 1.

With regard to dependent claims 2 and 3, Applicant asserts that they are allowable in that they depend from an allowable base claim.

With regard to claim 4, Applicant has placed the limitations of claim 4 within amended claim 1, and claim 4 has thereafter been deleted without prejudice.

With regard to amended independent claim 15, it describes Applicant's invention as depicted in Figs. 1-6. A first limitation of claim 15 is "depositing a polishing stop layer upon said components, with portions of said stop layer being deposited upon the top surface portions of said components;". A review of Roth reveals that Roth's stop layer 18 is not deposited upon the components 14, but rather upon a layer of material which has been deposited upon the components 14. Therefore, Roth fails to teach Applicant's invention as recited in claim 15.

With regard to amended independent claim 27, it describes Applicant's invention as depicted in Figs. 7-13. Particularly, a first limitation within claim 17 is "depositing a first layer of material upon a substrate, wherein a projecting portion of said first layer of material is deposited on top of said components, and wherein said first layer is deposited to a depth that is less than a projecting height of said components;". Roth teaches that components 14 are covered by a first layer 16. However, Roth does not teach anything with regard to the thickness of the layer 16 in comparison to the height of the components 14. Particularly, Roth does not teach that the thickness of the layer 16 should be less than the height of the components 14, as is specifically set forth in amended independent claim 27. Additionally, Roth fails to teach the limitation of "depositing a polishable layer on top of said stop layer, wherein portions of said polishable layer are deposited on top of said portion of said stop layer that are deposited on top of said projecting portions of said first layer;". Rather, in Roth, as depicted in Figs. 2, 3 and 4,

the portions of the stop layer 18 that are deposited on top of the projecting portions of the first layer are removed (see Fig. 3) prior to the deposition of the polishable layer 20 on top of the stop layer. For these reasons, Applicant submits that Roth does not teach Applicant's invention as set forth in amended independent claim 27.

In paragraph 3 of the Office Action claims 1-3, 5-7,9-10,15,17-19, 21-22 are rejected under 35 U.S.C. 102(e) as being anticipated by Cheng et al (6,086,777), stating:

> "As to claims 1,3, and 15, Cheng et al disclose a polishing process for a polishable material (20) over a barrier layer or polish-stop layer (18), which is deposited over the substrate having components (14), which is projecting upwardly (col. 5, lines 16-18, lines 66-col. 6, lines 2 and figure 2).
>
> As to claims 5-7 and 17-19, Cheng et al also disclose a polishing —stop layer of tantalum (18) having a thickness range from about 300 to about 500 angstroms (col. 5, lines 37-49).
>
> As to claims 9-10 and 21-22, Cheng et at teach that a portion of the polish-stop layer using ion-etching process, wherein the etching gas comprises argon (col. 3, lines 64-col. 4, lines 3 and col. 5, lines 17-20)."

Responsive thereto, Applicant asserts that amended independent claims 1 and 15, together with the dependent claims set forth in this rejection are not taught by Cheng '777.

Regarding amended independent claim 1, Applicant has inserted by amendment the limitation previously set forth in dependent claim 4 (which is not rejected based upon Cheng), and based thereon, Applicant asserts that amended independent claim 1 is not taught by Cheng.

With regard to dependent claims 2-3, 5-7, 9-10, Applicant notes that these claims are dependent, either directly or indirectly, upon amended independent claim 1, and based thereon, Applicant asserts that these claims are allowable.

With regard to amended independent claim 15, Applicant has inserted the limitation previously set forth in dependent claim 16 (which is not rejected based upon Cheng), and based thereon, Applicant asserts that amended independent claim 15 is not taught by Cheng.

Regarding dependent claims 17-19 and 21-22, Applicant notes that these claims are dependent, either directly or indirectly, from amended independent claim 15, and based thereon, Applicant asserts that these claims recite allowable subject matter.

In paragraphs 4, 5 and 6 of the Office Action claims 11-13, 16, 23-25,28-29 and 33-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roth et at (5,272,117) as applied to claims 1-4,15 and 27 above, and further in view of Jaso et al (5,246,884), stating:

> "Roth et al discussed above in the paragraph No 2 above and also teach that the etch-stop or polish-stop layer could comprises diamond (col. 3, lines 51-58).
>
> As to claims 12-13,24-25,29, 33,36-37, Roth et at fail to teach that the polish-stop layer is diamond-like-carbon (DLC).
>
> In a method of using an etch-stop or polish-stop layer, Jaso et at teach that diamond or diamond-like-carbon (DLC) can be used as an etch stop layer (col. 3, lines 24-28). Jaso et al also teach that the stop layer is removed by a reactive ion etching such as oxygen ashing process (col. 3, lines 53-55 and col. 4, lines 52-53).
>
> Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to employ Jaso et al's teaching into Roth et al's method because both the diamond and diamond-like-carbon (DLC) are functionally equivalent as taught by Jaso et al.
>
> As to claim 16, Roth et al teach that the planarizing or polishable layer (20) is deposited over the projected components (14) to cover the entire surface of the substrate (see figure 4). So, it would have been obvious that the depth of the polishable layer is greater than the projected height of the components.
>
> As to claim 28, Roth et al teach that the first layer (16) is deposited to maintain the topography of the projected components (14) (col. 3, lines 24-35). So, it would have been obvious to have the deposited depth of the first layer smaller than the projected height of the components.
>
> As to claims 11, 23 and 35, Roth et al teach that the etch-stop layer is polished at a slower rate than the polishable layer (col. 3, lines 52-54). Roth et al also teach that the exposed stop-layer is removed subsequent the polishing process (col. 5, lines 10-11)."

Responsive thereto, Applicant respectfully traverses this ground of rejection and asserts that the dependent claims rejected herein are allowable.

With regard to dependent claims 11-13, 23-25, 29, and 33-37, Applicant asserts that these claims are allowable in that they depend, either directly or indirectly from an allowable amended independent claim 1, 15 or 27, as is discussed hereabove.

With regard to dependent claim 16, as indicated hereabove, Applicant has inserted the limitations thereof into claim 15, and claim 16 has been deleted without prejudice. With regard to the allowability of claim 15, as discussed hereabove, it is allowable based upon limitations

other than the limitation previously set forth in claim 16. However, it is significant to note that the thickness of the layer 20 of Roth (see Fig. 4) has no relationship to the height of the components 14.

With regard to the rejection of claim 28, Applicant notes that the limitations of claim 28 have been inserted into independent claim 27, and claim 28 has been deleted without prejudice. Furthermore, Applicant respectfully traverses the Examiner's comments in rejecting claim 28. Specifically, Applicant asserts that Roth teaches nothing with regard to maintaining "the topography of the projected components 14 (col. 3, lines 24-35)." Rather, Roth does not focus at all on the height of the components 14, but is concerned with the creation of a layer above the components 14. Therefore, the actual thickness of the first layer is not discussed by Roth, and Roth provides no teaching that the thickness of the layer should be less than the height of the components as recited in the limitation previously set forth in claim 28 (and now set forth in amended independent claim 27).

Lastly, with regard to the comment in the Office Action regarding claims 11, 23 and 35, Applicant traverses the comment that Roth teaches that the stop layer is removed subsequent to the polishing process (col. 5, lines 10-11). Rather, as discussed hereabove, Roth teaches in Figs. 5-6 that portions of the stop layer are not removed subsequent to the polishing process.

In conclusion, Applicant asserts that the dependent claims that are rejected in this paragraph of the Office Action are allowable in that they dependent, directly or indirectly, from allowable base claims.

In paragraph 7 of the Office Action claims 14, 26 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roth et al (5,272,117) in view of Jaso et al (5,246884), as applied to claims 12-13, 16, 24-25,28-29, 33,36-37 above, and further in view of Yang et al (6,153,116), stating:

> "Modified Roth et al discussed above in the paragraph 6 but fail to teach that the end point of the CMP process is determined by monitoring a polishing motor current.
>
> However, in a method of end point detection of a CMP process, Yang et al teach that it is conventional to monitor the polishing motor current in order to detect an end point of a CMP process (col. 3, lines 45-67).
>
> Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to combine Yang et al's teaching into modified Roth et al's

process for efficiently detecting the end point of the polishing process as taught by Yang et al."

Responsive thereto, Applicant notes that claims 14, 26 and 38 are dependent claims, and Applicant asserts that these dependent claims are allowable in that they depend, either directly or indirectly from an allowable independent base claim; that is, amended independent claim 1, 15 or 27.

In paragraph 8 of the Office Action claims 30-31 and 34 are rejected under 35 U.S. 103(a) as being unpatentable over Roth et al (5,272,117) as applied to claims 1-4, 15 and 27 above, arid further in view of Cheng et at (6,086,777), stating:

"Roth et al discussed above in the paragraph 2.

As to claims 33 and 34, Roth et at disclose that tantalum containing stop layer is removed by ion etching (claim 33) but fail to disclose that the etching gas comprises argon (claim 34) (col. 3, lines 51-58, col. 6, lines 12-24).

However, Cheng et al teach that a portion of the polish-stop layer using ion-etching process, wherein the etching gas comprises argon (col. 3, lines 64-col. 4, lines 3 and col. 5, lines 17-20).

Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to combine Cheng et al's teaching into Roth et al's process by introducing a carrier gas such as argon for efficiently carry the etching gases into the etching system as taught by Chang et al."

Responsive thereto, Applicant notes that claims 30-31 and 34 are dependent claims, and Applicant asserts that these dependent claims are allowable in that they depend, either directly or indirectly from an allowable independent base claim; that is, amended independent claim 27.

In paragraph 9 of the Office Action claims 8, 20 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roth et at (5,272,117) in view of Jaso et al (5,246,884) as applied to claims 1-4,15 and 27 above, and further in view of Martin et at (5,707,409), stating:

"Modified Roth et at discussed in the paragraph 6 above but fail to teach that the thickness of the DLC is in the range of approximately 200 Angstroms.

However, in a method of hard carbon coating, Martin et al teach that most preferable thickness of a DLC film is in the range of 100 to 5000 Angstroms. Martin et al also teach that it is expensive to make a thicker film and also becomes brittle and lose adhesion (col. 8, lines 20-31).

> Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to combine Martin et al's teaching into modified Roth et al's teaching in order to form a DLC film with lower thickness such as approximately 200 Angstroms because thicker film becomes relatively expensive, brittle and lose adhesion as taught by Martin et al."

Responsive thereto, Applicant respectfully traverses this ground of rejection and asserts that Martin fails to teach or render obvious the use of a DLC layer as an etch stop layer having a thickness in the range of approximately 200 Å. Particularly, Martin '407 teaches an abrasive article having a DLC layer is used as a top coat or as a layer that is located between the abrasive coating and a covering layer. Thus, the teachings of Martin basically amount to the simple indication that a DLC layer can be formed having a 200 Å thickness. There is no teaching in Martin that such a layer will act efficaciously as a polishing stop layer in a CMP process. Based thereon, Applicant submits that claims 8, 20 and 32 recite patentable subject matter. Additionally, Responsive thereto, Applicant notes that claims 8, 20 and 32 are dependent claims, and Applicant asserts that these dependent claims are allowable in that they depend, either directly or indirectly from an allowable independent base claim; that is, amended independent claim 1, 15 or 27.

In paragraph 10 of the Office Action further prior art is made of record and not relied upon. Applicant has reviewed this prior art and believes that the teachings thereof are at most merely cumulative to the teachings of the applied prior art.

Having responded to all of the paragraphs of the Office Action, and having amended the claims accordingly, Applicant respectfully submits that the Application is now in condition for allowance. Applicant therefore respectfully requests that a Notice of Allowance be forthcoming

at the Examiner's earliest opportunity. Should the Examiner have any questions or comments with regard to this amendment, a telephonic conference at the number set forth below is respectfully requested.

Respectfully submitted,

Dated: January 8, 2003

ROBERT O. GUILLOT
Reg. No. 28,852

IPLO®
Intellectual Property Law Offices
1901 S. Bascom Avenue, Suite 660
Campbell, CA 95008
Telephone: (408) 558-9950
Facsimile: (408) 558-9960

CERTIFICATE OF MAILING (37 CFR 1.8(a))

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited on January 8, 2002 with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Washington; D.C., 20231.
Date: January 8, 2002

Patricia Beilmann

ATTACHMENT A - S/N 09/754,235

MARKED UP AMENDED CLAIMS

1. (Once amended) A method for controlling the end point of the chemical mechanical polishing (CMP) of a surface having a plurality of projecting components fabricated thereon, comprising the steps of:

fabricating a plurality of upwardly projecting components upon a substrate surface;

fabricating a first material layer that is deposited in part upon a top surface of said projecting components and in part upon a top surface of said substrate;

fabricating a CMP polishing end stop layer above said [components] first material layer;

fabricating a polishable layer above said stop layer;

conducting a CMP polishing step utilizing a polishing slurry that selectively removes said polishing layer as compared to said stop layer;

removing portions of said stop layer subsequent to said polishing step.

15. (Once amended) A method for controlling the end point of a chemical mechanical polishing (CMP) process of a surface having a plurality of upwardly projected components fabricated thereon, comprising the steps of:

depositing a polishing stop layer upon said components, with portions of said stop layer being deposited upon the top surface portions of said components;

depositing a polishable layer upon said stop layer, wherein said polishable layer is deposited to a depth that is greater than a projecting height of said components;

conducting a CMP polishing step utilizing a polishing slurry that selectively removes said polishing layer as compared to said stop layer; wherein said CMP polishing step is conducted down to said portions of said stop layer that cover said top surface portions of said components;

removing said portions of said stop layer that cover said top surface portions of said components.

27. (Once amended) A method for controlling the end point of a chemical mechanical polishing (CMP) process of a substrate surface having a plurality of upwardly projecting components fabricated thereon, comprising the steps of:

depositing a first layer of material upon said substrate, wherein a projecting portion of said first layer of material is deposited on top of said components, and wherein said first layer is deposited to a depth that is less than a projecting height of said components;

depositing a polishing stop layer upon said first layer of material, with a portion of said stop layer being deposited on top of said projecting portions of said first layer;

depositing a polishable layer on top of said stop layer, wherein portions of said polishable layer are deposited on top of said portion of said stop layer that are deposited on top of said projecting portions of said first layer;

removing portions of said polishable layer and said stop layer that are deposited on top of said projecting portions of said first layer;

conducting a CMP polishing step utilizing a polishing slurry that selectively removes said polishable layer as compared to said stop layer;

removing said stop layer from said first layer.

29. (Once amended) A method for controlling CMP polishing as described in claim [28] 27 wherein said stop layer is comprised of a substance selected from the group consisting of tantalum and diamond like carbon (DLC).

30. (Once amended) A method for controlling CMP polishing as described in claim [28] 27 wherein said stop layer is formed with a thickness of from 200 to 500 Å.

31. (Once amended) A method for controlling CMP polishing as described in claim [28] 27 wherein said stop layer is comprised of tantalum and is formed with a thickness of approximately 500 Å.

33. (Once amended) A method for controlling CMP polishing as described in claim [28] 27 wherein said stop layer is removed utilizing an ion etching process.

34. (Once amended) A method for controlling CMP polishing as described in claim [28] 27 wherein said stop layer is comprised of tantalum and wherein said stop layer is removed utilizing an argon ion etching process.

35. (Once amended) A method for controlling CMP polishing as described in claim [28] 27 wherein said stop layer is removed utilizing a CMP process [including].

38. (Once amended) A method for controlling CMP polishing as described in claim [28] 27 wherein an end stopping point of said CMP process is determined by monitoring a polishing motor current during said CMP polishing step.